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The Implications of the Central Bank Policies for the Romanian Banking System Liquidity

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Abstract

The Romanian banking system experienced a liquidity shock in October 2008, following the Lehman Brothers collapse. The impact of external liquidity turmoil was a sudden stop of external inflows, slump in credit activity and higher money market volatility. Considering these strong implications, the National Bank of Romania (NBR) stepped in and injected liquidity in order to stabilize the banking sector. This study aims to analyze the ability of the central bank's open market operations to restore the banking system stability after the Lehman Brothers failure. The results confirm that the central bank policies improved the liquidity of Romanian banking system and prevented a disorderly deleverage. Nevertheless, due to the strong severity of the prolonged global financial and economic crisis, credit growth ratio didn't return to the level experienced before October 2008.

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Keywords: banking system; liquidity shock; financial stability

1. Introduction

Central banks responsibility on banking system liquidity consists in accommodating short term liquidity flows that influence the developments of money market interest rates. In Romania, a large share of loans bear variable interest rate, compounded from the 3 or 6 months interest rates on Romanian or euro area money market, depending on the currency in which the loan is denominated, plus a fix margin. Consequently, the

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volatility of interest rate paid for the loans is function of money market volatility.

In normal times, the credit and deposit facilities provided by the central bank to the credit institutions succeed to keep the short term interest rate in a narrow range and protect borrowers from sudden jumps in credit costs. Nevertheless, during financial crisis, when liquidity dries up from the money market and banking system, central banks step in and inject liquidity through repo operations or other transactions with banks.

In Romania, after the Lehman Brothers failure (September 2008), the short term interest rates spiked due to the high uncertainty and those developments triggered central bank interventions. The instrument used by NBR to inject liquidity was repo transactions, providing short term loans to the banks against government securities.

This study aims to detect if the impact of NBR interventions on money market after the onset of global financial crisis in September 2008 prevented a credit burst and disorderly deleverage in the banking sector. Our findings offer a perspective on how the central bank's open market operations impact the banking system.

2. Literature review

The literature on banking system liquidity risk is vast and is extending rapidly since the global financial crisis inception in 2008. Allen and Moessner (2013) determined the impact of euro area sovereign debt crisis on liquidity position of financial groups. Belke et all (2010) and Cetorelli and Goldberg (2011) analysed liquidity risk within banking groups, whereas Agenor and El Anynaoui (2010) observed that excess liquidity within banking system jeopardizes the efficiency of central bank tightening. Moreover, liquidity risk measurement should consider the macroeconomic and structural factors together with banks balance sheet information, following Mannasoo and Mazes (2009). Bellini (2013) developed an integrated risk model for the banking system where he incorporated liquidity risk to measure short run solvency risk. A systemic dimension of liquidity risk is emphasized by Adrian and Brunnermeier (2011), whilst Kunt and Huizinga (2010) assessed banks liquidity risk based on their funding strategies and income structure.

Goddard et all (2009) and Kempa (2008) assessed the impact of 2007 liquidity crisis on developed interbank markets, including the central bank interventions. Kempa (2008) concluded that central banks have to control the market expectations to succeed in their attempt to lower the short term interest rates. Another paper on the central bank intervention on money market during a liquidity crisis is elaborated by Freixas et all (2010). They considered that the central bank should decrease the interest rate when a few banks experience liquidity deficits, while the proper solution for the central bank to solve a generalized liquidity crisis is to inject liquidity.

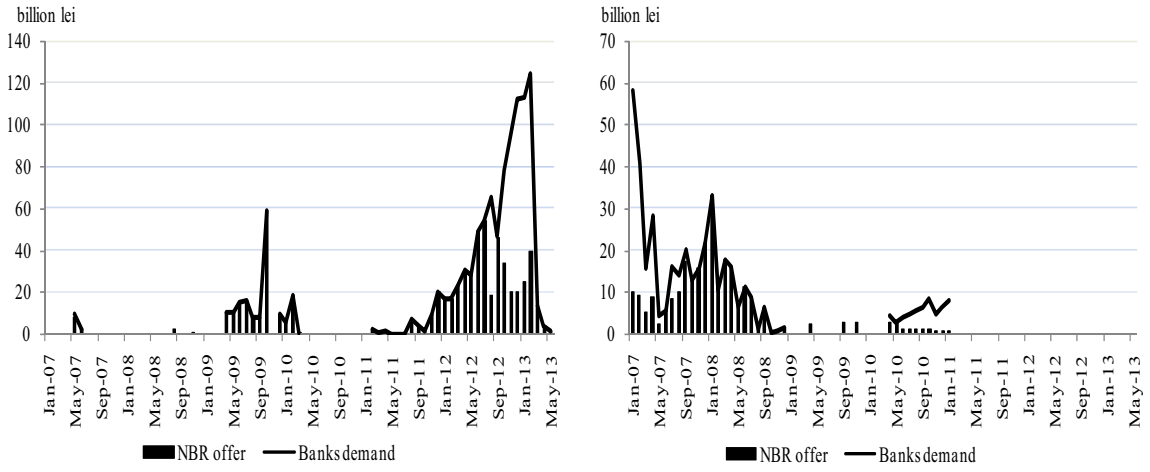
Cornet et all (2011) observed that is more efficient for banks to provide liquidity to both borrowers and depositors, instead of splitting these two activities to separate institutions. Ivashina and Scharfstein (2010) analysed lending activity in USA during the 2008 -2009 crisis and concluded that bank debtors executed credit lines to obtain liquidity.

3. Data

We collected data on Romanian banking system and both domestic and foreign financial markets for empirical purposes. Dataset is structured in banks balance sheet information (total assets, external funding), open market transactions carried out by NBR with credit institutions (repo transactions, deposits taking), key interest rates on Romanian and euro area money markets and the exchange rate between euro and local currency (leu). All the data but interest rates on euro area money market are available on NBR website, whereas information on euro area money market was collected from Deutsche Bundesbank website. The time series frequencies are daily for financial market data and monthly for balance sheet information. The data cover the period between January 2007 and April 2013.

In pre-crisis period (before September 2008), NBR carried out almost no repo transactions. The liquidity from both internal and external resources was abundant and NBR accommodated this excessive liquidity from

the banking system through deposit taking. After the inception of global financial crisis in September 2008, liquidity regime switched from abundant liquidity to outflows and assets depreciation. Therefore, NBR entered repo transactions with credit institutions to accommodate demand and supply on money market and prevent disorderly deleverage in the banking system (Figure 1).



Source: National Bank of Romania (NBR)

Figure 1. (a) Repo transactions with NBR; (b) Bank deposits at NBR (auctions)

4. The model

The model considered for this analysis is a system with two multiple linear regressions, where the endogenous variables are volatility of short term interest rate and total banking system assets in Romania. The model consists of the following equations:

$$\mathrm{VOLROBOR3M}_t = \alpha_0 + \alpha_1 \mathrm{REPO\_NBR}_t + \alpha_2 \mathrm{DEP\_NBR}_t + \alpha_3 \mathrm{VOLEURIBOR3M}_t + \alpha_4 \mathrm{EUR\_RON}_t + \varepsilon_t \quad (1)$$

$$\mathrm{BANK\_ASSETS}_t = \beta_0 + \beta_1 \mathrm{BANK\_ASSETS}_{t-1} + \beta_2 \mathrm{REPO\_NBR}_t + \beta_3 \mathrm{DEP\_NBR}_t + \beta_4 \mathrm{EXT\_FUNDING}_t + u_t \quad (2)$$

where VOLROBOR3M and VOLEURIBOR3M are the volatility of 3 months interest rates on money markets in Romania (ROBOR3M) and euro area (EURIBOR3M), REPO_NBR is the volume of repo transactions carried out by NBR with banks, DEP_NBR measures deposit auctions carried out by NBR, EUR_RON is the euro/leu exchange rate, BANK_ASSETS counts for total Romanian banking system assets and EXT_FUNDING represents total external funding for Romanian banking system. All the variables have monthly frequency, with daily time series being converted into monthly data using average. Details regarding the model variables are in Appendix A.

The first equation tests for central bank impact on short term interest rates through repo transactions, especially during financial turmoil, whereas the second equation determines the central bank ability to prevent banking system from disorderly deleverage during distress conditions in financial system. In equation 2 the

endogenous variable with 1 lag becomes explicative variable due to the serial correlation in error term.

OLS (Ordinary Least Square) and quantile regression techniques are applied for the model. The OLS provides mean and unbiased coefficients estimation, whilst the quatile regression detects the relation between variables for different segments of their distributions. See Koenker and Hallock (2001) for details about quantile regressions and the optimization functions behind them. The quantile regression estimations, in particular, determine the influence of central bank open market operations on the volatility of short term interest rate and financial intermediation during liquidity turmoil.

5. The results

The model is estimated threefold because of the developments in opened market operations carried out by the central bank during the analyzed period. Before the crisis, the majority of NBR operations were deposits taking through auctions, whilst the central bank switched to repo transactions during the crisis to offer liquidity to the banking system. In this respect the model is estimated for the entire sample period, as well as for the pre-crisis and crisis periods.

The exchange rate has the most significant influence on the volatility of short term interest rates, among the exogenous variables (Table 1). The volatility on money market tends to decrease in crisis period when the exchange rate is depreciating because the local currency liquidity of banking system increases. The direct linkage between the two variables in pre-crisis period can be explained by the strong currency appreciation that was not accompanied by a similar movement in money market volatility.

The volatility of short term interest rates increased during crisis, when NBR entered repo transactions with banks. The NBR attempt to lower the spreads on money market had no benefits for volatility in the first place due to the high uncertainty within financial system; still the positive implications for the money market become visible after a few months.

Table 1. The model estimation results (OLS, equation 1)

The dependent variable: VOLROBOR3M (the volatility of 3 months interest rate on money market)						
	Entire period		Jan 2007 – Sept 2008		Oct 2008 – Apr 2013	
	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
Intercept	3.4870*	[1.6801]	-2.6540	[-0.8835]	22.7350***	[5.6385]
REPO_NBR	0.0282	[0.4008]	-	-	0.1192**	[2.1641]
DEP_NBR	-0.0411	[-0.4143]	-0.6870	[-1.4991]	-	-
VOLEURIBOR3M	0.0435	[0.4869]	-0.0192	[-0.1358]	-0.0513	[-0.5379]
EUR_RON	-6.3531*	[-1.9581]	9.2524*	[1.7272]	-37.6428***	[-5.6963]
Number of observations	76		21		55	
Breusch-Godfrey Serial Correlation LM Test (F-statistic/Probability)	5.1986/0.0079		0.9829/0.3971		1.0328/0.3636	

Note: significance levels - 1% ***, 5% **, 10% *

External funding has strong influence on financial intermediation in Romania because the internal saving ratio is bellow the economy financing needs. During financial crisis the funding from parent banks slumped, causing domestic lending activity to freeze (Table 2). The model results do not detect a significant relation between the NBR open market operations and total banking system assets. These findings are in line with the assumption that NBR repo transactions only prevented deleverage in the banking system after the Lehman

Brothers failure. The NBR objective was not to stimulate financial intermediation, but to preserve the system stability.

Table 2. The model estimation results (OLS, equation 2)

The dependent variable: BANK_ASSETS (the total Romanian banking system assets)						
	Entire period		Jan 2007 – Sept 2008		Oct 2008 – Apr 2013	
	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
Intercept	0.1747***	[5.2465]	0.4929***	[5.6810]	-0.0619	[-0.4240]
BANK_ASSETS (-1)	0.8416***	[30.4743]	0.5411***	[7.3269]	0.9131***	[22.7780]
REPO_NBR	0.0001	[0.1456]	-	-	0.0001	[0.0288]
DEP_NBR	-0.0003	[-0.3911]	-0.0018	[-0.5418]	-	-
EXT_FUNDING	0.1178***	[4.8678]	0.3388***	[6.2910]	0.1440***	[3.0440]
Number of observations	75		20		54	
Breusch-Godfrey Serial Correlation LM Test (F-statistic/Probability)	0.3011/0.7409		0.5700/0.5781		1.0343/0.3633	

Note: significance levels - 1% ***, 5% **, 10% *

To enhance the findings from OLS estimations, we run Granger causality test. The aim is to investigate further the relation between central bank open market operations and the stability of banking system. The results are the following:

Table 3. The results for Granger causality test (F – Statistic)

Null Hypothesis:	Entire period	Jan 2007 – Sept 2008	Oct 2008 – Apr 2013
REPO_NBR does not Granger Cause VOLROBOR3M	0.3465	-	0.49913
VOLROBOR3M does not Granger Cause REPO_NBR	2.12599	-	1.79068
DEP_NBR does not Granger Cause VOLROBOR3M	0.49913	0.55935	-
VOLROBOR3M does not Granger Cause DEP_NBR	1.79068	2.78781*	-
REPO_NBR does not Granger Cause BANK_ASSETS	1.69242	-	2.48509*
BANK_ASSETS does not Granger Cause REPO_NBR	5.28044***	-	4.2457**
DEP_NBR does not Granger Cause BANK_ASSETS	1.84556	0.92305	
BANK_ASSETS does not Granger Cause DEP_NBR	3.03414*	8.55586***	

Note: significance levels - 1% ***, 5% **, 10% *

The results for Granger causality test confirm no direct causality between the volatility of money market interest rates and NBR open market operations. During liquidity crisis, uncertainty in financial system spiked and the central bank liquidity injections proved to be a stabilizing factor for the overall market conditions, but the immediate and direct impact on money market volatility has low statistical power.

On the other hand, the banking system assets caused the developments in NBR open market operations. This result enhances the conclusion that the central bank intervened in the money market only to accommodate short term liquidity demand and supply and not to foster the expansion of financial intermediation.

In addition to OLS estimations, we run quantile regression to observe the relation between variables at the tail of the distributions. The difference between OLS and quantile regression is that quantile regression minimizes the absolute value of residuals for specific quantiles of variable distributions; therefore the residuals

sign has an impact on estimation results.

The quantile regression results (see Appendix B) confirm the initial findings that the impact of NBR open market operations on money market volatility and financial intermediation is only for systemic stabilization purposes. The central bank is not a major driver of the above mentioned variables, acts just to correct imbalances within the banking system.

6. Conclusions

The empirical findings indicate that the opened market operations carried out by Romanian central bank have been effective in accommodating liquidity demand and supply on money market, as well as preventing a disorderly deleverage in the aftermath of Lehman Brothers failure. NBR acted only to stabilize the banking sector and did not pursue to liquidity injections in order to foster lending activity. During the financial crisis, central banks across the globe, mainly in developed financial systems, expanded their balance sheets by consistent amounts to provide liquidity to the banking sector, while persuading the banks to use those resources for granting loans to real sector.

Further work is necessary to assess the long term implications of central bank's open market operation for financial stability. In this respect, moral hazard is an important issue because banks may loose incentive to mitigate liquidity risk if the central bank will step in whenever liquidity dries up in the banking sector.

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Appendix A. The description of model variables

ID	Name	Frequency	Source of primary data
VOLROBOR3M	The log volatility of 3 month interest rate on Romanian money market	Daily	National Bank of Romania (NBR) website
VOLEURIBOR3M	The log volatility of 3 month interest rate on euro area money market	Daily	Deutsche Bundesbank website
REPO_NBR	The log of repo transactions carried out by NBR	Daily	NBR website
DEP_NBR	The log of deposits taking by NBR through auctions	Daily	NBR website
EUR_RON	The log of EUR/RON exchange rate	Daily	NBR website
BANK_ASSETS	The log of Romanian banking system assets	Monthly	NBR website
EXT_FUNDING	The log of bank foreign liabilities	Monthly	NBR website

Appendix B. Estimated coefficient for NBR open market operations using quantile regressions (+/- 1 standard deviation)